

Application No. 09/582,049
Confirmation No. 6845

REMARKS

Claims 1-4 and 7-12 are pending in the application. Of these claims, claims 1-4 and 7-10 stand rejected and claims 11 and 12 stand allowed.

Reconsideration is respectfully requested.

Claims 1-4, 7, and 8 stand rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent 5,182,091 to Yuge et al. (Yuge) in view of DE 29 24 584 (the '584 reference), U.S. Patent 6,231,826 to Hanazawa et al. (Hanazawa) and optionally further in view of U.S. Patent 5,961,944 to Aratani et al. (Aratani). This rejection is traversed because there is no motivation for combining Yuge and Hanazawa, and Yuge and Aratani, as proposed by the Examiner.

The Examiner correctly states that Yuge does not disclose the use of a "a cold crucible" as called for in claims 1-4, 7, and 8, as Yuge discloses a quartz crucible 2 with a heat insulating lining 3. Thus, Yuge actually teaches away from using a cold crucible because Yuge uses the heat insulating lining to retain the heat in the wall of the crucible, instead of a coolant to pull the heat away from the wall of the crucible to keep it cool, as is the case with a cold crucible. Yuge also teaches in column 2, lines 52-54 that the silica constituting the crucible wall is indispensable for carbon removal.

The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of invention to use a cold crucible, as disclosed in Hanawaza and optionally in Aratani, in the process of Yuge. Hanazawa, however, teaches away from the use of cold crucible because they are inefficient. Hanazawa solves the inefficiency problem by disclosing and claiming a process and apparatus for refining silicon that does not use a cold crucible, but instead uses a graphite vessel having no water cooling system. There is nothing in Hanazawa or in the prior art that would suggest that one of ordinary skill in the art would consider the graphite

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vessel of Hanazawa to be the same as a cold crucible, as argued by the Examiner. Accordingly, no motivation exists for replacing the quartz crucible in Yuge with a cold crucible.

Aratani teaches using a cooper-made water cooled crucible as retaining container for melting metallic silicon, however, Yuge teaches away from the use of a water cooled crucible and a crucible which is made of cooper and not of silica. Accordingly, no motivation exists for replacing the quartz crucible in Yuge with a cold crucible.

Still further, claim 1 requires "causing the silicon melt from a bottom of the crucible to ascend along a central axis thereof to a free surface of the silicon melt, to turbulently stir the silicon melt." The Examiner relies on the arrows shown in Fig. 1 of Yuge to disclose the above feature of the invention. Yuge, however, does not state or explain what the arrows represent. Hence, the Examiner is merely speculating about what the arrows are disclosing. At best, one of ordinary skill in the art may consider that the arrows represent stirring of the molten silicon. Absent the present disclosure, one of ordinary skill in the art would not recognize the arrows in Fig. 1 of Yuge as disclosing "causing the silicon melt from a bottom of the crucible to ascend along a central axis thereof to a free surface of the silicon melt, to turbulently stir the silicon melt."

In view of the foregoing, claims 1-4, 7 and 8 are clearly allowable over Yuge in view of the '584 reference, Hanazawa and further in view of Aratani. Accordingly, withdrawal of this rejection is respectfully urged.

Claims 9 and 10 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Yuge in view of the '584 reference, Hanazawa and U.S. Patent 4,048,436 to Hiratake et al. (Hiratake), optionally further in view of Aratani. This rejection is traversed because there is no motivation for combining Yuge and Hanazawa, and Yuge and Aratani, as proposed by the Examiner.

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The arguments set forth above regarding Yuge and Hanazawa, and Yuge and Aratani are incorporated herein by reference. Based on these arguments alone, claims 9 and 10 are allowable over Yuge in view of the '584 reference, Hanazawa and Hiratake and further in view of Aratani.

In addition, Yuge in view of the '584 reference, Hanazawa and Hiratake and further in view of Aratani fail to teach or suggest "a cold crucible...having a coil supplied by an A.C. voltage" as called for in claims 9 and 10.

Further, claims 9 and 10 require "a removable magnetic yoke (3) between the plasma torch (2) and the crucible (1) for inverting a stirring direction of the silicon load, the yoke being ring-shaped to enable the passing of the plasma flame (f)." The Examiner relies upon the rotating magnetic field generating means 44e disclosed by Hiratake for this feature. The means 44e, however, is not disclosed in Hiratake as being removable, as required in claims 9 and 10. Contrary to the Examiner's position on this issue, the mere fact that the rotating magnetic field generating means 44e of Hiratake may be ring-shaped does not make it removable.

In addition, the claimed magnetic yoke's removable structure makes it capable of allowing the stirring direction of the silicon load to be inverted. Because means 44e of Hiratake is not removable, means 44e is not capable of "inverting a stirring direction of the silicon load" as required by claims 9 and 10. Thus, claims 9 and 10 further distinguish over the cited prior art including Hiratake.

In view of the foregoing, claims 9 and 10 are clearly allowable over Yuge in view of the '584 reference, Hanazawa and Hiratake and further in view of Aratani. Accordingly, withdrawal of this rejection is respectfully urged.